# Linen

*By* Mary M. Atwater

IN collections of ancient household equipment—I am thinking particularly of the interesting and complete collection of Colonial relics in the Pennsylvania Museum at Philadelphia—one finds, naturally enough, many implements used in the important household craft of cloth-making. Looms of all sizes—from huge affairs as big as a modern bungalow down to little garter looms or lap-looms—spinning wheels large and small, click reels for skeining, niddy-noddies, bobbin winders, warping frames, shuttles—all these things are more or less familiar. One may, however, be doubtful as to the use of some other pieces of equipment—a stout table, for instance, made of a very thick plank or slab of wood with a long slot through the center, the whole mounted on short legs and furnished with a heavy wooden beater that is hinged to the table at one end. This is a "scutch" or breaking table for flax. Also used in the preparation of flax-fibres are certain heavy blocks of wood thickly set with long iron spikes. These are the heckles or hackles through which the bunches of fibre were combed to free them of straw and of the broken fibres called "tow."

The processes of preparing flax in Colonial times were probably not very different—except for the use of metal hackles—from the processes used for the same purpose by the Lake-Dwellers of Switzerland who lived and wove at a very remote period, toward the end of the stone age. Among the relics of this far distant human life have been found hanks of prepared flax fibre and pieces of coarse linen cloth—probably the oldest fragments of textile fabric in the world. But it seems likely that the use of linen goes centuries further back than the lake-dwellers, to still more remote weavers whose art has perished. Probably flax has been cultivated, retted, hackled, spun and woven for six thousand years, and how much longer, who can say.

The "lint" or flax plant has been cultivated so long and so widely that it is impossible to say to what country it is native. It is an annual plant with a straight stem, delicate leaves and a small flower, growing about three feet high—an insignificant little plant of incalculable importance in the life of the human race.

The plant requires very careful husbandry. After the seeds come up and the shoots are an inch or two high, a flax field must be very carefully weeded by hand, and every vestige of weed growth must be removed. The crop requires a good deal of moisture, and it must be harvested at just the right moment—when the stems are yellow for three quarters of their length. When harvested it is not mowed like hay but is plucked, root and all, and tied in bundles, care being taken to have all the stalks in one bundle of approximately the same length. Removing the seed-pods—a process called "rippling"—is ordinarily performed by hand, as no very effective way of doing it by machinery has been found. The seeds—the well-known linseed—is valuable for its oil and its medicinal properties as well as for planting, and must be carefully gathered.

But the most trying process in the preparation of flax-fibre is the maceration, or "retting" of the stalks. This is usually carried on in the open air, in shallow ponds or in gently flowing streams, and sometimes on the open ground in a shady place where dew and rain fall plentifully. The water for the retting of flax must be very pure and soft—entirely free of minerals such as iron, and also free of lime. A trace of iron in the water stains and spoils the flax, and lime is highly injurious.

The flax-plants, tied in small bundles, are immersed in the water and weighted so that they will not float away, and are allowed to remain till fermentation is set up and until maceration has proceeded just far enough. This may take from three days to a month, depending on the temperature and constitution of the water, and there is no way of determining it except constant attention and the taking of frequent samples. If macerated too long, the fibres will be weakened, and if not

allowed to ferment long enough it will later be impossible to free the fibres completely from the straw and pith of the stems, and the resulting flax will be of poor quality. A few hours of carelessness, or a lack of experience, may result in the loss of an entire crop.

Modern industry has experimented with a number of methods of conducting this process in a more positive manner, but so far nothing has been found as good as the ancient method, and the finest flax of today is still prepared in the old way.

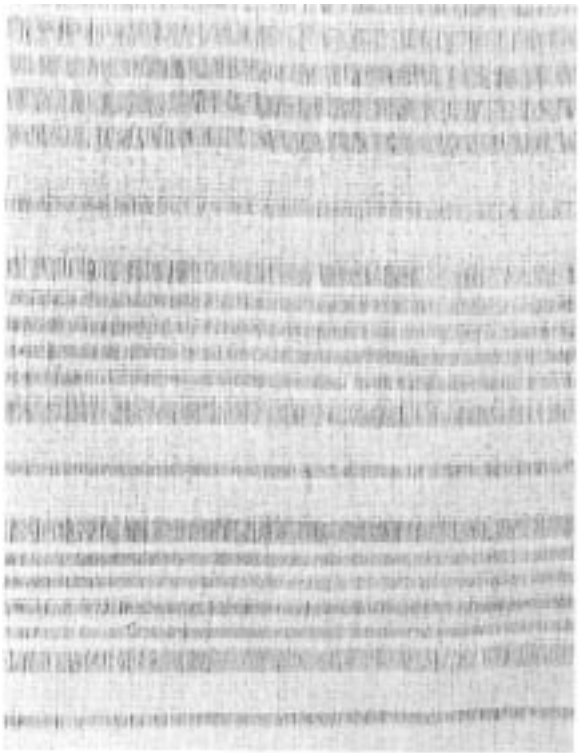

ILLUSTRATION 1

It is easy to see one reason why linen is more expensive than cotton—which lends itself readily to machine methods of treatment and handling.

After retting, the flax must be thoroughly and evenly dried, and is then ready for the breaking table. Scutching breaks up the pith and straw, much of which is immediately removed by blowing. Short fibres, broken fibres, and what remains of the straw is removed by the hackling process. On care and thoroughness in the hackling depends much of the beauty of the future linen fabric.

Hackling by hand in the ancient manner is heavy labor. When we think of this, and examine the fine linens woven by our Colonial forebears we must admire the conscientious craftsmanship. No wonder our great grandmothers loved and treasured their lovely linens, and laid them carefully away in lavender! They knew the life-history of every shining thread, from the flat, round seed scattered in spring across the plowed field, through all the processes of retting, hackling, spinning and weaving, up to the smooth and lustrous product. The modern housekeeper spends her money for what her chosen shop chooses to sell her, and knows as a rule very little about what she is buying.

There are a number of fibrous plants whose fibres are prepared much as flax is prepared and that are more or less used in the textile arts. Of these hemp is perhaps the oldest and the most widely grown. "Hemp" is a rather general name, used for a whole tribe of plants that differ a good deal among themselves. The hemp fibre is coarser and harsher than flax, though some qualities approach in fineness the coarser grades of flax. In ancient Egypt, hemp and flax were sometimes mixed in the same fabric, and to distinguish one from the other is not always easy.

Hemp and jute are not the same thing, though many people confuse them because both are now used chiefly for the making of rope and cords. Jute, very widely used today, is a plant requiring special conditions of soil and climate, and is grown almost exclusively in India. Besides its use in the making of ropes, it is woven into burlap sacking and is even used for the backing of cheap floor-coverings and sometimes in handicraft. It is a lustrous fibre, takes dye readily, but is stiff and quite coarse.

The fibre that most closely approaches flax in beauty is ramie. The plant comes originally from China and is sometimes called China Grass; it can, however, be grown in many climates and has been introduced into the United States with success. A good deal of ramie is now grown in California. The fibre is very soft and silky, rather more lustrous than flax but not perhaps quite as strong. Though it has been known and used from very ancient times, it is still in its infancy as far as the industrial arts are concerned. This is because it is even more difficult to prepare than flax, and no special process has yet been devised that seems satisfactory.

The spinning of flax is now rarely done by hand, though spinning is an agreeable occupation for the fingers, and the handspun threads are delightful to use in weaving.

The linen threads available to a modern weaver come in a wide variety of kinds, qualities and "grists." Not long ago linens for weaving were to be had only in very large, troublesome skeins, but most linens in common use can now be had spooled. This is a great convenience.

Linen threads are reckoned on an ancient scale entirely different from the scale for cotton or wool. A "cut" of linen is three hundred yards, and the grist of the yarn is reckoned from the number of

cuts to the pound. A "twenties" linen is a thread that runs twenty cuts—or 6000 yards—to the pound. A "40/2" linen is a two-ply thread made of two forties threads twisted together, and will have the same yardage as a twenties single. With the grist of the thread indicated it is therefore easy to figure the yardage to the pound of any particular thread. To know this is useful when calculating the amount of material required for a piece of weaving.

What thread to choose for a particular purpose is largely a matter of taste. Some people prefer coarse linens, that are certainly very handsome by

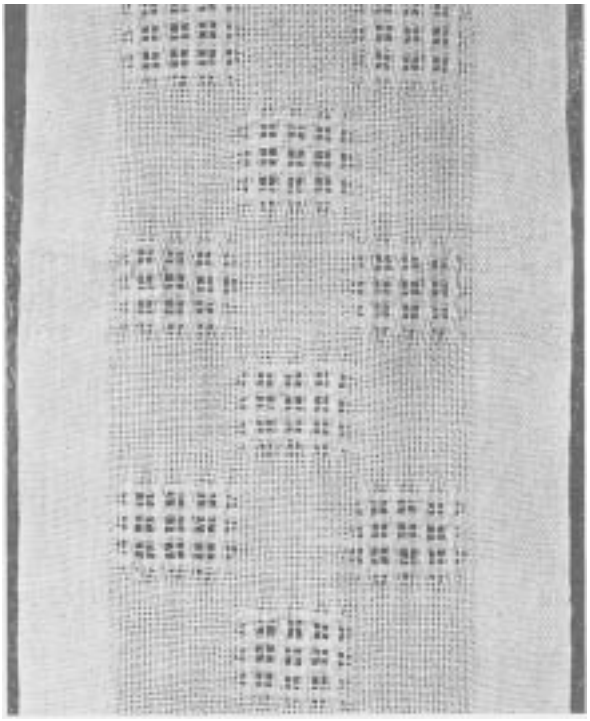

ILLUSTRATION 2

their weight and sturdiness, while others prefer fine and delicate effects, that are very lovely too. The success or failure of a particular piece of weaving in linen depends very much on the spacing of the warp and on the balance between warp and weft materials. There is no rule. The thing is a matter of experience, experiment, or rule-of-thumb directions.

There are two main kinds of linen thread,—flat or "line" linen and round linen. Round linen is smoother and stronger than flat linen, but if used both as warp and weft produces a wiry fabric, for many purposes not so beautiful as the more supple fabric made of line linen. And too, the slight irregularities of line linen add a great deal to the character of the fabric.

There is a very great difference in price, and also in strength, between what are sold as warp linens and what are sold as weft linens. No one should be tempted by the lower price to try warping with weft linen. Such an attempt will result in failure—much loss of time, many broken threads, and an unsatisfactory result. One may, however, use warp linen as weft, and in fact it is usually advisable to do so in hand-weaving, as the result is a handsomer and stronger fabric. The ordinary weft linen, however, makes very attractive and inexpensive towels when woven on a fine white cotton warp, and is good enough for the purpose.

Colored linens are very much more expensive than natural or bleached linens, and for good reason. Linen is extremely refractory to dye-stuffs, absorbing an enormous quantity of dye—as much as pound for pound for some strong colors—and requiring more time and trouble in the handling than wool or cotton. People who have not tried their hand at dyeing linen rarely know this, and the cost of colored linen sometimes seems to them excessive.

No doubt it is to the difficulty in dyeing that we owe some of the beautiful weaves evolved for the decoration of linen. A rude and simple weave will be interesting and beautiful if woven of carefully arranged colors, but to produce patterns without color, simply by subtle differences in weave, is a much more difficult type of art. Weaving in linen requires a special technique, as different from the technique of weaving in wool and cotton as drawing in pen and ink differs from oil painting.

The ordinary four-harness overshot weave, so handsome when woven in wool or silk, often looks stringy and "poor" in linen,—especially if the pattern selected has any very long skips. Linen threads do not fluff up and cling together like wool; they have no elasticity.

The most beautiful weave for linen is undoubtedly the damask weave. This is a weave in which the pattern consists of figures in sateen on a satin ground, the difference in texture being depended on to produce the decorative effect. The lowest terms of the satin tie is the four-harness tie, and the five-harness tie is much handsomer. This means that on an ordinary loom four or five harnesses will be required for each block of the pattern. The effect can be produced on a smaller number of harnesses by using two sets of harnesses, one set with ordinary heddles and the other with long-eyed heddles, and drawing each warp-thread through a heddle of each set. The looms on which the earliest weaves of this sort were made in this country were looms of a large number of harnesses, as many as forty having been used. Most damask is, however, woven on Jacquard looms. And all of this is beyond the reach of most modern handlooms and hand-weavers.